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PREFACE

This report concerns a study which is part of the SKI performance assessment project SITE-94. SITE-94 is a performance assessment of a hypothetical repository at a real site. The main objective of the project is to determine how site specific data should be assimilated into the performance assessment process and to evaluate how uncertainties inherent in site characterization will influence performance assessment results. Other important elements of SITE-94 are the development of a practical and defensible methodology for defining, constructing and analyzing scenarios, the development of approaches for treatment of uncertainties and evaluation of canister integrity. Further, crucial components of an Quality Assurance program for Performance Assessments were developed and applied, including a technique for clear documentation of the Process System, the data and the models employed in the analyses, and of the flow of information between different analyses and models.

Björn Dverstorp
Project Manager

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1 SUMMARY

A simple biosphere model has been designed for use in the SKI Project SITE-94 related to a hypothetical repository for spent nuclear fuel on the island of Äspö near Oskarshamn in southern Sweden.

The model provides results in terms of radiation dose per 1 Bq/y, unless otherwise indicated, and results will thus have to be scaled with actual flux of radionuclides per year entering the primary biosphere recipients.

The model does not include radioactive decay as there is assumed no delay in the model system, except for where explicitly mentioned. Specifically, no radioactive transitions resulting in daughter nuclides are considered.

Calculated yearly individual and population committed (50 years) radiation doses to man are expressed in terms of Sv/y and radiation dose rates to fish are expressed as mSv/h, under the assumption of a flux of one Bq per year into the primary biosphere recipient.

Calculated radiation doses resulting from the present biosphere model are hypothetical, and should under no circumstances be considered as real. Neither should they be used as quantitative information for decision purposes.

The biosphere model is of a rough and primitive character and its precision, relative to the real biosphere in the surroundings of Äspö is envisaged to be several orders of magnitude.

2 INTRODUCTION

The present biosphere model was developed by the SSI in co-operation with the SKI and with the Expert Group of the SKI project SITE-94.

Within the SKI project SITE-94 a repository for spent nuclear fuel from the Swedish nuclear energy programme is hypothetically located in hard rock at about 500 meters depth on the island of Äspö (Andersson, 1992).

Project SITE-94 studies the safety aspects of this hypothetical repository. Any weakness in repository performance will reveal itself as a leakage of radionuclides out of the repository, and finally into the biosphere where man and nature are at risk of being exposed. Thus, as the final link in estimating such leakage, a biosphere model will provide an estimate of resulting radiation impact on man and nature.

Outflow of radionuclides from the geosphere constitutes input to the biosphere model. For simplicity however, input flux in the biosphere model has been set to 1 Bq/y for each radionuclide in question, unless otherwise indicated, which value will have to be scaled with actually calculated flux of radionuclides in geosphere in order to provide estimates of radiation doses.

It should be stressed that calculated radiation doses resulting from the present biosphere model are hypothetical, and should under no circumstances be considered as real.

It has been discussed within the SSI whether radiation doses calculated with a biosphere model like the present one for remote future times really should be expressed in the usual manner in terms of Sv/y. One argument against this would be that calculated doses never will be real doses, as are incurred for example during normal operation of a nuclear power plant.

The SSI is concerned that dose levels in a remote future calculated with a biosphere model shall not be relied on as hard information for decisions. They are of value merely as qualitative measures of radiation impact under the partly unrealistic and biased underlying abstractions and assumptions regarding repository, geosphere and biosphere properties.

Particularly due to the difficulty of knowing the properties of the biosphere and the events taking place there in a remote future time, the spread in possible radiation impact will be very large.

The biosphere model is therefore of a rough and primitive character and its precision, relative to the real biosphere in the surroundings of Äspö (of which we can neither know the future state nor very accurately model the present state), is envisaged to be several orders of magnitude.

It might be argued that the present biosphere model is *too* rough. One argument in support of the model characteristics is however that the precision of a model will not be better than the precision of its input data. The input data to the present model - compared to the real biosphere - is indeed very rough, and this fact should not be disguised behind smooth curves which easily tend to give a false impression of precision.

Generally, parameter values have been chosen or sanctioned by the SKI.

Parameter values have been chosen carefully and often with a slight pessimistic bias, in order not to underestimate resulting radiation exposures.

Dose factors for oral and inhalation exposure of man have been derived from (SSI FS, 1989), for external exposure of man from (Kocher, 1983) and dose factors for exposure of fish have been taken from (IAEA, 1988). Consumption factors and specific pathway exposure times for a critical group have been taken from (Sundblad 83/571, 1983 and Sundblad 83/572, 1983). Intrusion modelling is based on (Charles, 1991).

3 BIOSPHERE MODEL

The present biosphere model involves a stationary scenario (Reference Scenario) and a climate evolution scenario (Central Scenario). The stationary and the time evolution scenarios contain as primary recipients a well and the bay of the Borholmsfjärd, i. e. the waters surrounding the island of Äspö. The time evolution scenario additionally incorporates as primary recipients a waste sample from intrusion and, in a remote future time, the Baltic sea.

Transport of radionuclides within the model system is assumed to be essentially immediate, except for in sediment subject to land rise. Except for this pathway, radioactive decay is therefore not included at all in the model. Land rise sediment modelled to be subject to radioactive decay from the time the sediment no longer constitutes sea bottom until the desired time point of the model. Correction for radioactive decay is thus generally supposed to be made outside the biosphere model.

Unless otherwise indicated, yearly individual and population committed (50 years) radiation doses to man are considered.

Unless otherwise indicated, all scenarios involve a constant flux of 1 Bq/y of each radionuclide considered into the respective primary recipient. This constant feature is justified on the following grounds:

- Insofar as the time scale for variations of radionuclide flux out of the repository[1] is much longer than one year, which is expected, variations in the biosphere model on a shorter time scale will have negligible influence on the results.

- Further, insofar as turnover rates in recipients of the biosphere model are much higher than once per year, which will be the case for all recipients except the Baltic sea, a constant radionuclide flux will be well justified.

- Assuming that all radionuclides leaving the repository will finally collect in the Baltic sea (thus suppressing the turnover rate of the Baltic sea, presently around 25 years) a constant radionuclide flux can be used also for the Baltic sea in order to model the radionuclide content thereof in a remote future time.

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[1] prior to correction for radioactive decay

Nominal values of radionuclide flux will finally be multiplied with the radiation dose per one Bq per year resulting from the model in order to obtain scaled radiation doses.

3.1 Reference Scenario

The Reference Scenario assumes stationary present conditions.

Radionuclides originating in the hypothetical HLW repository on the Äspö island will reach each of the following primary recipients at a rate of 1 Bq/y:

- A well on the Äspö island. The well provides contaminated drinking water for people and is also used for irrigation of agricultural land, leading to external exposure, inhalation of contaminated dust and ingestion of contaminated vegetables and soil.

- The bay of the Borholmsfjärd, i e the brackish waters surrounding the Äspö island. Some fractions of the radionuclides in the bay sorb on sediment and will not be accessed by pathways considered here. Fish in the bay accumulates radionuclides, leading to individual doses to the fish. Contaminated fish is also consumed by people.

The exposure pathways of the Reference Scenario are illustrated in Diagram 1.

3.2 Central Scenario

The central scenario assumes evolving climatic and geological conditions. The climate will gradually become colder and in parallel the sea level will first start to fall locally. Between 50 000 and 100 000 years in the future the climate will be glacial and too cold for man. The Äspö island will be located below sea level during the last part of this period. After 100 000 years in the future, climate and sea level will be restored to present values, except that the Baltic sea is modelled as having no outlet.

Radionuclides originating in the hypothetical HLW repository on the Äspö island will reach each of the following primary recipients at a rate of 1 Bq/y, unless otherwise indicated:

- A well on the Äspö island. The well provides contaminated drinking water for people and is also used for irrigation of agricultural land, leading to external exposure, inhalation of contaminated dust and ingestion of contaminated vegetables and soil. After 50 000 years in the future the exposure pathway will disappear.

- The bay of the Borholmsfjärd, i e the brackish waters surrounding the Äspö island. Due to land rise the depth of the bay will decrease until it becomes a lake. Contaminated fish in the bay is consumed by people. Some fractions of the radionuclides in the bay sorb on sediment and will be accessed for agricultural purposes after sufficient land rise has taken place, but before the climate has become too cold, leading to external exposure, inhalation of contaminated dust and ingestion of contaminated vegetables and soil. After 50 000 years in the future the exposure pathway will disappear.

- A HLW sample, containing 1 Bq of each radionuclide is extracted from the repository by an intruder. Deliberate intrusion into the repository takes place and thereby a sample of waste (volume $2.83\ 10^{-3}$ [m^3]) is brought up to ground level. The sample is analysed, during which operation an individual is exposed to external radiation, oral intake and inhalation of dust from the sample. After 50 000 years in the future the exposure pathway will disappear.

- The Baltic sea after 100 000 years in the future contains 1 Bq of each radionuclide, all radionuclides from the repository assumedly being collected in it and in its sediment. The Baltic sea is modelled as having its present volume, but no outflow. Contaminated fish in the Baltic sea is consumed by people.

The model includes the following scenario variables (or switches), for future conditions affecting intrusion and population radiation dose levels respectively:

- Technological level of society (low, as present, high)

  At the low level no intruders exist, due to lack of technology for excavating rock at repository depth. At the present level an intruder will be exposed. At the high level an intruder will be aware of the dangers with radionuclides and will avoid most of the exposure.

- Population densities of man and biota (low, as present, high)

  At the low level population densities are lower than at present and at the high level they are higher.

All exposure pathways of the central scenario are illustrated in Diagram 2-3.

3.3 Expressions for Activity Concentration

Activity concentration in the well and the bay of the Borholmsfjärd is expressed as:

$$C_{well} = \alpha/Q_{well}; \qquad [\ Bq/m^3\ ] \qquad (1)$$

$$C_{wat} = (\alpha/Q_{wat})/[\varepsilon + (1\text{-}\varepsilon)\ K_{d\ sed}\ \rho_{sed}]; \qquad [\ Bq/m^3\ ] \qquad (2)$$

where the radionuclide flux α = 1 Bq/y for every radionuclide under consideration. Q_{well} [m^3/y] is the flux of water through the well and Q_{wat} [m^3/y] is the flux of water through the bay of the Borholmsfjärd. $\varepsilon = V_{wat}/(V_{wat} + V_{sed})$ [-] is the relative volume of water to the volume of water plus sediment. $K_{d\ sed}$ [m^3/kg] is the distribution coefficient for a radionuclide between sediment and water and ρ_{sed} [kg/m^3] is the sediment density. In the Reference Scenario V_{wat} is constant, whereas it varies with time for the Central Scenario as V_{wat} [(95/100) (2.3-0.0025 t)/2.3 + (5/100) (8-0.0025 t)/8], subject to the condition that no term in the expression will become negative, and thus taking time dependent rate of land rise (0.0025 m/y) into account and that 95 % of the projected area is modelled with a depth of 2.3 m and the remaining 5 % with a depth of 8 m, under the additional condition that the water volume is not allowed to fall below V_{wat}/1000 [m^3]. Similarly Q_{wat} varies in the Central Scenario in proportion to V_{wat}. λ is the radiological decay constant of the nuclide in question and t [y] is time.

Activity concentration of a HLW sample obtained during intrusion is

$$C_{intr\ ext} = \alpha/v_{sample}; \qquad [\ Bq/m^3\ ] \qquad (3)$$

where α strictly means 1 Bq here rather than 1 Bq/y.

The measure of the activity concentration in the Baltic sea after the end of the glaciation period, to be multiplied and thus scaled by the total inventory of each radionuclide after correction for decay, i. e. after 100 000 years, and which consitutes an upper bound, is:

$$C_{Baltic} = (\alpha/V_{Baltic})\ /[\varepsilon + (1\text{-}\varepsilon)\ K_{d\ sed}\ \rho_{sed}]; \qquad [\ Bq/m^3\ ] \qquad (4)$$

where ε is the ratio of water volume to water plus sediment volume of the Baltic sea and α strictly means 1 Bq rather than 1 Bq/y.

Agricultural land irrigated with contaminated water gives the following expressions for activity concentration in vegetables, soil and soil dust and areal activity concentration in soil:

$$C_{irr\ veg} = C_{well}\ I\ [\ (r/Y)_{veg}\ \zeta^{veg}(\lambda_{eff},t_e)_{veg} + (B_{veg}/P_{soil})\ \zeta^{soil}(\lambda_{eff},t_b)\ ]; \ [\ Bq/kg\ ] \qquad (5)$$

$$C_{irr\ soil} = C_{well}\ I\ (B_{soil}/P_{soil})\ \zeta^{soil}(\lambda_{eff},t_b); \qquad [\ Bq/kg\ ] \qquad (6)$$

$$C_{irr\ dust} = C_{well}\ I\ k_{res}\ \zeta^{soil}(\lambda_{eff},t_b)\ B_{soil}; \qquad [\ Bq/m^3\ ] \qquad (7)$$

$$E_{irr\ ext} = C_{well}\ I\ \zeta^{soil}(\lambda_{eff},t_b)\ B_{soil}; \qquad [\ Bq/m^2\ ] \qquad (8)$$

where $(r/Y)_{veg}$ [m^2/kg] is the ratio of interception factor and areal density for vegetables, B_{veg} [kg soil/kg veg] and B_{soil} [-] are the concentration ratios, P_{veg} and P_{soil} [kg soil/m^2] are the areal soil densities, k_{res} [1/m] is the resuspension factor, and the build-up function ζ is as follows:

$$\zeta(\lambda,t) = [\ 1 - e^{-(\lambda\ t)}\ ]/\lambda; \qquad [\ y\ ] \qquad (9)$$

$$\lambda^{veg}{}_{eff} = \lambda_{rad} + \lambda_{wea}; \qquad [\ 1/y\ ] \qquad (10)$$

$$\lambda^{soil}{}_{eff} = \lambda_{rad} + \lambda_{leach}; \qquad [\ 1/y\ ] \qquad (11)$$

where λ is a decay constant due to radiation, weathering of vegetables or leaching in soil and functionally related to half-life through $\lambda = \ln(2)/t_{½}$.

Contaminated sediment from the bay of the Borholmsfjärd is supposed to be used as agricultural land, after land rise has taken place. For this pathway radioactive decay has been taken into account due to the delay of radionuclides in the sediment. Radioactive decay is here considered only in an approximate manner, i. e. from the time when the sediment no longer constitutes sea bottom until the desired time point for dose impact calculation and not including in-growth of daughter nuclides. The following expressions result for activity concentration in soil, soil dust, vegetables and areal activity concentration in soil:

$$C_{lr\ soil} = K_{d\ sed}\ \alpha/(q_o\ A_{wat})/[\varepsilon + (1-\varepsilon)\ K_{d\ sed}\ \rho_{sed}]\ e^{-\lambda(t-tlr)}; \quad [\ Bq/kg\ ] \qquad (12)$$

$$C_{lr\ dust} = C_{lr\ soil}\ \rho_{sed}\ d_{lr\ sed}\ k_{res}; \qquad [\ Bq/m^3\ ] \qquad (13)$$

$$E_{lr\ soil} = C_{lr\ soil}\ \rho_{sed}\ d_{lr\ sed}; \qquad [\ Bq/m^2\ ] \qquad (14)$$

$$C_{lr\ veg} = C_{lr\ soil}\ B_{veg}; \qquad [\ Bq/kg\ ] \qquad (15)$$

Here $\varepsilon = (q_o\ A_{wat})/[(q_o\ A_{wat}) + V_{sed}]$, where the yearly volumetric flux of contaminated water up through sediment to the bay of the Borholmsfjärd, q_o [$m^3/(m^2\ y)$] times the corresponding surface area A_{wat} [m^2], is assumed to be equilibrated with the sediment volume of the bay, V_{sed} [m^3], thus not being completely rigorous in dimensional regard. Further, t_{lr} is the time when sediment from the bay of the Borholmsfjärd no longer constitutes sea bottom and t is the desired time point.

Activity concentration in fish is expressed as follows:

$$C_{fish} = C_{wat} K_{d\ fish}; \qquad [\ Bq/kg\ ] \qquad (16)$$

where $K_{d\ fish}$ [m^3/kg] is the bioaccumulation factor for fish (e.q. distribution coefficient between fish and water).

3.4 Expressions for Radiation Dose

From the concentrations above committed individual radiation doses are calculated as follows for exposure during one year:

$$D_{well} = Df_{oral}\ C_{well}\ G_{wat}; \qquad [\ Sv/y\ ] \qquad (17)$$

$$D_{veg} = Df_{oral}\ (C_{veg}\ G_{veg} + C_{soil}\ G_{soil}); \qquad [\ Sv/y\ ] \qquad (18)$$

$$D_{dust} = Df_{inhal}\ C_{dust}\ W; \qquad [\ Sv/y\ ] \qquad (19)$$

$$D_{ext} = Df_{ext}\ E_{soil}\ T_{ext\ soil}; \qquad [\ Sv/y\ ] \qquad (20)$$

$$D_{fish} = Df_{oral}\ C_{fish}\ G_{fish}; \qquad [\ Sv/y\ ] \qquad (21)$$

where Df [Sv/Bq or (Sv/h)/(Bq/m^2)] is a dose factor, G [m^3/y or kg/y] is a consumption rate, W [m^3/y] is the human respiration rate adjusted with a retention factor of 0.75, and T [h/y] is an exposure time.

Dose rate *to* fish is estimated as follows:

$$D^{fish} = Df^{fish}\ C_{wat}; \qquad [\ mSv/h\ ] \qquad (22)$$

where Df^{fish} [(mSv/h)/(Bq/m^3)] is the dose factor and D^{fish} is dose rate to fish.

Intrusion exposure is modelled as follows:

$$D_{intr\ ext} = 1.4\ 10^{-13}\ C_{intr}\ E\ v_{sample}\ T_{ext\ intr}\ \Phi_{tech}; \qquad [\ Sv/event\ ] \qquad (23)$$

$$D_{intr\ inhal} = Df_{inhal}\ C_{intr}\ v_{dust}\ \Phi_{tech}; \qquad [\ Sv/event\ ] \qquad (24)$$

$$D_{intr\ oral} = Df_{oral}\ C_{intr}\ v_{oral}\ \Phi_{tech}; \qquad [\ Sv/event\ ] \qquad (25)$$

where the constant 1.4 10^{-13} [Sv/(h MeV)] is valid at 1 m distance, E is the mean gamma energy per disintegration [MeV/Bq], v_{sample} [m^3] is the volume of a sample from intrusion. $v_{oral} = m_{oral}/\rho_{sample}$ [m^3/event], $v_{dust} = \rho_{dust}/\rho_{sample}$ (W/8760) $T_{inhal\ intr}$ [m^3/event], m_{oral} [kg/event] being the mass ingested of the sample, ρ_{sample} [kg/m^3] being the mass density of the sample, the factor 8760 in the denominator being used to convert the inhalation rate W from [m^3/y] to [m^3/h] and ρ_{dust} [kg/m^3] being the air dust concentration from the sample.

Here, Φ_{tech} [-] is a factor for future technological level in society. Φ_{tech} assumes the value 0 for LOW level, 1 for PRESENT level and 10^{-3} for HIGH level. Default value for Φ_{tech} = 1 (PRESENT).

No population doses are assumed to be generated from intrusion.

Population doses finally, are modelled with N, the number of persons regularly consuming drinking water from the well and being exposed to the irrigation pathways, and M, the number of persons regularly consuming fish:

$$D^{pop}_{well} = N\, D_{well}\, \Phi_{pd}; \qquad [\text{ manSv/y }] \qquad (26)$$

$$D^{pop}_{veg} = N\, D_{veg}\, \Phi_{pd}; \qquad [\text{ manSv/y }] \qquad (27)$$

$$D^{pop}_{dust} = N\, D_{dust}\, \Phi_{pd}; \qquad [\text{ manSv/y }] \qquad (28)$$

$$D^{pop}_{ext} = N\, D_{ext}\, \Phi_{pd}; \qquad [\text{ manSv/y }] \qquad (29)$$

$$D^{pop}_{fish} = M\, D_{fish}\, \Phi_{pd}; \qquad [\text{ manSv/y }] \qquad (30)$$

Here, Φ_{pd} [-] is a factor for future population density level in society. Φ_{pd} assumes the value 10^{-1} for LOW level, 1 for PRESENT level and 10 for HIGH level. Default value for Φ_{pd} = 1 (PRESENT).

4 RESULTS

Tables of doses resulting per 1 Bq/y are provided below for the Reference Scenario and for the Central Scenario. Parameter values used in the model are provided in the lists below.

For the Central Scenario resulting tables of doses are provided for the following times in the future: 0, 5 000, 25 000 and 125 000 years. This is so because:

- Doses from the fish pathways asymptotically reach a constant value after about 3 200 years. With the exception of the land rise sediment pathway, all other pathways provide constant doses up to 50 000 years in the future, whereafter they disappear. The land rise sediment pathway includes radioactive decay from the time some of the sediment no longer constitutes sea bottom, i. e. about 930 (2.33 m mean depth divided by a rate of landrise of 0.0025 m/y) years in the future, until the calculated time point, maximally 50 000 years in the future, and correction for the time up to 930 y, if desired, can be made outside the model.

- After the glaciation period, i. e. after 100 000 years in the future, the only remaining pathway is consumption of fish from the Baltic, of which the dose level actually constitutes an upper bound for this pathway. Important here is the assumption of constant flux (of 1 Bq of each radionuclide).

Thus, the results provided for the Central Scenario cover the time period considered, i. e. from 0 to beyond 100 000 years in the future.

For limits of dose to fish 5.7 [µSv/h] has been mentioned to provide protection for fish populations (NCRP, 1991), and a reference level of 0.4 [mSv/h] is said to maintain ecological stability at the population and organism level.

As has been mentioned elsewhere in this report, the resulting values of dose should be used very carefully. It should be borne in mind that the precision of them, compared to the properties of the real biosphere, will be several orders of magnitude. They do however provide a qualitative indication that appears to be consistent with other biosphere models, for instance like the reference dose factors for Swedish nuclear power stations.

5 USE OF THE BIOSPHERE MODEL

The biosphere model is coded in EXCEL and a copy of the software will be made available to the SKI.

The software is intended for internal use only at the SKI. The SSI does not assume any liability with respect to the biosphere model software. In particular the SSI will not assume any responsibility for results obtained at the SKI with the software. The SSI strongly advices against any change of the software except for changes of parameter values.

The SSI recommends use of the calculated dose factors in the tables provided below. In case that the SKI desires to change any parameter value of the model, the resulting dose factor will in most cases be obtained simply by multiplicative adjustment of the calculated dose factor (see relevant equations above).

The switches for technological level of future society and for population density have been set at their default values, i. e. equal to 1, throughout the calculations. To change the value of any of these switches the dose in question will be affected simply by multiplication with the selected factor.

Correction for decay will have to be made on a general basis outside the present biosphere model, as well as correction due to formation of daughter nuclides. In land rise sediment however, correction for decay (not daughters) in the model has been made in an approximate manner, taking into account the delay from time of land rise until time of calculation.

For the land rise sediment pathway of the Central Scenario it is also important to note that the scaling factor for calculation of scaled doses, i. e. the number of Bq/y entering the primary recipient, is to be evaluated at a time representative for the build-up of contamination in the sediment, preferably 930 years, and not at the time of evaluation of the dose, unless time of evaluation is earlier than 930 years.

For the Baltic sea pathway, the complete inventory of radionuclides, corrected for decay and daughters, is to be multiplied with the formula for dose impact in order to yield the scaled dose impact.

For the intrusion pathway, the inventory of radionuclides in the intruded sample volume, corrected for decay and daughters, is to be multiplied with the formula for dose impact in order to yield the scaled dose impact.

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7 List of Symbols

A	[m^2]	Surface area
B	[kg soil/kg]	Concentration ratio
C	[Bq/m^3 or Bq/kg]	Activity concentration
d	[m]	Depth
D	[Sv/y]	Committed radiation dose
Df	[Sv/Bq or (Sv/h)/(Bq/m^2)]	Dose factor
D	[mSv/h]	Dose rate to biota
Df	[(mSv/h)/(Bq/m^3)]	Dose factor to biota
E	[Bq/m^2]	Areal activity concentration
f_{ret}	[-]	Fraction retained in breathing
G	[m^3/y or kg/y]	Consumption rate
I	[m^3/m^2 y]	Irrigation rate
K_d	[m^3/kg]	Distribution coefficient
k_{res}	[1/m]	Resuspension factor
N	[-]	No. of persons drinking well water
m	[kg]	Oral mass ingestion - Intrusion
M	[-]	No persons eating fish
P	[kg soil/m^2]	Areal soil density
q_o	[$m^3/(m^2$ y)]	Groundwater flux up through sediment
Q	[m^3/y]	Water flux
r	[-]	Interception factor
t	[y]	Time
T	[h/y or h/event]	Time of exposure
v	[m^3 or m^3/event]	Volume
V	[m^3]	Water volume
Y	[kg/m^2]	Areal density for vegetation
W	[m^3/y]	Human respiration rate adjusted
α	[Bq/y]	Activity flux
ε	[-]	Porosity
ζ	[y]	Integrated decay function
λ	[1/y]	Decay constant
ρ	[kg/m^3]	Mass density or concentration
Φ	[-]	Scenario variable

7.1 SUBSCRIPT AND SUPERSCRIPT

b	buildup
Baltic	Baltic sea
dr wat	drinking water
dust	dust
e	exposure
eff	effective
ext	external
fish	fish
inhal	inhalation
intr	intrusion
irr	irrigation
leach	leaching
lr	land rise
oral	oral ingestion
p	post-glaciation
pd	population density
pop	population
rad	radiological
ret	retained
sample	sample from intrusion
sed	sediment
soil	soil
tech	technology level of society
veg	vegetables
wat	bay of the Borholmsfjärd
wea	weathering
well	well

8 Parameter Values - Reference Scenario

A_{wat}	$1.43\ 10^6$	[m^2]	Surface area of Borholmsfjärd
B_{soil}	1	[-]	Concentration ratio for soil
B_{veg}	0.03	[kg soil/kg veg]	Concentration ratio for vegetables
f_{ret}	0.75	[-]	Fraction retained in breathing
G_{fish}	30	[kg/y person]	Fish consumption rate
G_{soil}	$36.5\ 10^{-3}$	[kg/y person]	Soil consumption rate
G_{veg}	75	[kg/y person]	Vegetables consumption rate
$G_{dr\ wat}$	0.5	[m^3/y person]	Drinking water consumption rate
I	0.12	[m^3/m^2 y]	Irrigation rate
k_{res}	10^{-8}	[1/m]	Resuspension factor
N	120	[-]	No. of persons drinking well water
M	10^3	[-]	No. of persons eating fish
P_{veg}	200	[kg soil/m^2]	Areal soil density for vegetables
P_{soil}	12	[kg soil/m^2]	Areal soil density for pure soil
Q_{wat}	$9.46\ 10^7$	[m^3/y]	Water flux through bay of Borholmsfjärd
Q_{well}	10^4	[m^3/y]	Water flux through well
q_o	10^{-4}	[m^3/m^2 y]	Groundwater flux up through sediment
$(r/Y)_{veg}$	0.02	[m^2/kg]	Interception factor
t_b	30	[y]	Buildup time
t_{leach}	70	[y]	Leaching time
t_e	14/365	[y]	Irrigation exposure time
t_{wea}	60/365	[y]	Weathering time
$T_{ext\ soil}$	10^3	[h/y]	Time of external exposure
V_{sed}	$5.72\ 10^6$	[m^3]	Sediment volume of bay of Borholmsfjärd
V_{wat}	$3.33\ 10^6$	[m^3]	Water volume of bay of Borholmsfjärd
W	$6.3\ 10^3$	[m^3/y]	Human respiration rate adjusted
α	1	[Bq/y]	Activity flux to primary recipient
ε_{wat}	0.37	[-]	Porosity in the bay of Borholmsfjärd
ρ_{sed}	$1.25\ 10^3$	[kg/m^3]	Sediment density in bay of Borholmsfjärd

PARAMETER VALUES - CENTRAL SCENARIO

- if different from Reference Scenario

d_{sed}	0.5	[m]	Depth of sediment after land rise
m_{oral}	$25\ 10^{-6}$	[kg]	Oral mass ingested from intrusion
$T_{ext\ intr}$	25	[h/event]	Time of external exposure, intrusion
$T_{inhal\ intr}$	10^{-1}	[h/event]	Inhalation time of sample, intrusion
v_{sample}	$2.83\ 10^{-3}$	[m^3]	Intrusion sample volume
V_{Baltic}	$2.2\ 10^{13}$	[m^3]	Water volume of the Baltic sea
ε_{Baltic}	0.98	[-]	Porosity of the Baltic sea
ε_{lr}	0.20	[-]	Porosity in bay after land rise
ρ_{dust}	$5\ 10^{-6}$	[kg/m^3]	Dust density in air from intrusion
ρ_{sample}	$2.5\ 10^{3}$	[kg/m^3]	Sample density from intrusion
$\Phi_{tech=LOW}$	0	[-]	Technology switch, level = LOW
$\Phi_{tech=PRESENT}$	1	[-]	Technology switch, level = PRESENT
$\Phi_{tech=HIGH}$	10^{-3}	[-]	Technology switch, level = HIGH
$\Phi_{pd=LOW}$	10^{-1}	[-]	Population switch, level = LOW
$\Phi_{pd=PRESENT}$	1	[-]	Population switch, level = PRESENT
$\Phi_{pd=HIGH}$	10	[-]	Population switch, level = HIGH

PARAMETER VALUES - NUCLIDE DEPENDENT

Nuclide	$t_{½}$ [y]	$K_{d\ sed}$ [m^3/kg]	$K_{d\ fish}$ [m^3/kg]	Df_{oral} [Sv/Bq]	Df_{inhal} [Sv/Bq]	Df_{ext} [(Sv/h)/(Bq/m^2)]	Df^{fish} [(mSv/h)/(Bq/m^3)]
C-14	$5.73\ 10^{3}$	2	5	$6\ 10^{-10}$	$6\ 10^{-10}$		$6\ 10^{-7}$
Cl-36	$3.01\ 10^{5}$	0	$2\ 10^{-2}$	$8\ 10^{-10}$	$6\ 10^{-9}$	$3\ 10^{-14}$	$8\ 10^{-12}$
Ni-59	$7.50\ 10^{4}$	0.2	$5\ 10^{-2}$	$6\ 10^{-11}$	$7\ 10^{-10}$	10^{-15}	$4\ 10^{-9}$
Se-79	$6.50\ 10^{4}$	0.1	4	$3\ 10^{-9}$	$3\ 10^{-9}$		$2\ 10^{-7}$
Sr-90	28.8	0.1	$2\ 10^{-2}$	$5\ 10^{-8}$	$5\ 10^{-7}$	$5\ 10^{-15}$	10^{-9}
Zr-93	$1.53\ 10^{6}$	0.2	$6\ 10^{-2}$	10^{-9}	$3\ 10^{-7}$		$2\ 10^{-10}$
Nb-94	$2.03\ 10^{4}$	0.1	0.1	10^{-9}	$8\ 10^{-8}$	$5\ 10^{-12}$	$5\ 10^{-5}$
Tc-99	$2.13\ 10^{5}$	0.1	$2\ 10^{-2}$	$5\ 10^{-10}$	$3\ 10^{-9}$	$2\ 10^{-18}$	$2\ 10^{-9}$
Pd-107	$6.50\ 10^{6}$	0.2	0.1	$5\ 10^{-11}$	$5\ 10^{-9}$		$2\ 10^{-9}$
Sn-126	$1.00\ 10^{5}$	0.2	3	$5\ 10^{-9}$	$3\ 10^{-8}$	$2\ 10^{-13}$	
I-129	$1.60\ 10^{7}$	$2\ 10^{-2}$	$2\ 10^{-2}$	$3\ 10^{-7}$	$2\ 10^{-7}$	$7\ 10^{-14}$	$7\ 10^{-10}$
Cs-135	$2.30\ 10^{6}$	3	0.2	$2\ 10^{-9}$	10^{-9}		$4\ 10^{-9}$
Cs-137	30.2	3	0.2	10^{-8}	$8\ 10^{-9}$	$2\ 10^{-12}$	$2\ 10^{-7}$
Sm-151	90.0	10^{3}	$3\ 10^{-2}$	10^{-10}	10^{-8}	$2\ 10^{-17}$	$6\ 10^{-9}$
Ra-226	$1.60\ 10^{3}$	0.1	10^{-2}	$7\ 10^{-7}$	$3\ 10^{-6}$	$2\ 10^{-14}$	10^{-4}
Th-229	$7.34\ 10^{3}$	10	$3\ 10^{-2}$	$3\ 10^{-6}$	$6\ 10^{-4}$	$3\ 10^{-13}$	$4\ 10^{-4}$
Th-230	$7.70\ 10^{4}$	10	$3\ 10^{-2}$	$5\ 10^{-7}$	$3\ 10^{-4}$	$3\ 10^{-15}$	$3\ 10^{-5}$
Th-232	$1.41\ 10^{10}$	10	$3\ 10^{-2}$	$2\ 10^{-6}$	10^{-3}	$2\ 10^{-15}$	$3\ 10^{-5}$
Pa-231	$3.28\ 10^{4}$	1	10^{-2}	$7\ 10^{-6}$	$8\ 10^{-4}$	10^{-13}	$3\ 10^{-5}$
U-233	$1.59\ 10^{5}$	1	$5\ 10^{-3}$	10^{-7}	$5\ 10^{-5}$	$2\ 10^{-15}$	$6\ 10^{-7}$
U-234	$2.45\ 10^{5}$	1	$5\ 10^{-3}$	10^{-7}	$5\ 10^{-5}$	$3\ 10^{-15}$	$5\ 10^{-7}$
U-235	$7.04\ 10^{8}$	1	$5\ 10^{-3}$	10^{-7}	$3\ 10^{-5}$	$5\ 10^{-13}$	$5\ 10^{-7}$
U-236	$2.34\ 10^{7}$	1	$5\ 10^{-3}$	10^{-7}	$5\ 10^{-5}$	$2\ 10^{-15}$	$5\ 10^{-7}$
U-238	$4.47\ 10^{9}$	1	$5\ 10^{-3}$	10^{-7}	$3\ 10^{-5}$	$2\ 10^{-15}$	$5\ 10^{-7}$
Np-237	$2.14\ 10^{6}$	5	10^{-2}	$3\ 10^{-6}$	$3\ 10^{-4}$	10^{-13}	$6\ 10^{-7}$

PARAMETER VALUES - NUCLIDE DEPENDENT (CONTINUED)

Nuclide	$t_{1/2}$ [y]	$K_{d\ sed}$ [m^3/kg]	$K_{d\ fish}$ [m^3/kg]	Df_{oral} [Sv/Bq]	Df_{inhal} [Sv/Bq]	Df_{ext} [(Sv/h)/(Bq/m^2)]	Df^{fish} [(mSv/h)/(Bq/m^3)]
Pu-238	87.7	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$2\ 10^{-4}$	$3\ 10^{-15}$	$3\ 10^{-6}$
Pu-239	$2.41\ 10^4$	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$3\ 10^{-4}$	10^{-15}	$2\ 10^{-6}$
Pu-240	$6.57\ 10^3$	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$3\ 10^{-4}$	$3\ 10^{-15}$	$2\ 10^{-6}$
Pu-242	$3.76\ 10^5$	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$3\ 10^{-4}$	$2\ 10^{-15}$	$2\ 10^{-6}$
Am-241	433	10^3	$3\ 10^{-2}$	$2\ 10^{-6}$	$3\ 10^{-4}$	$9\ 10^{-14}$	10^{-5}
Am-243	$7.37\ 10^3$	10^3	$3\ 10^{-2}$	$2\ 10^{-6}$	$3\ 10^{-4}$	$2\ 10^{-13}$	$6\ 10^{-5}$
Cm-245	$8.50\ 10^3$	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$3\ 10^{-4}$	10^{-13}	$3\ 10^{-5}$
Cm-246	$4.75\ 10^3$	10^3	$8\ 10^{-3}$	$2\ 10^{-6}$	$3\ 10^{-4}$	-	$3\ 10^{-6}$
Cm-248	$3.39\ 10^5$	10^3	$8\ 10^{-3}$	$7\ 10^{-6}$	$8\ 10^{-4}$	-	$3\ 10^{-5}$

9 Diagram 1 - Reference Scenario

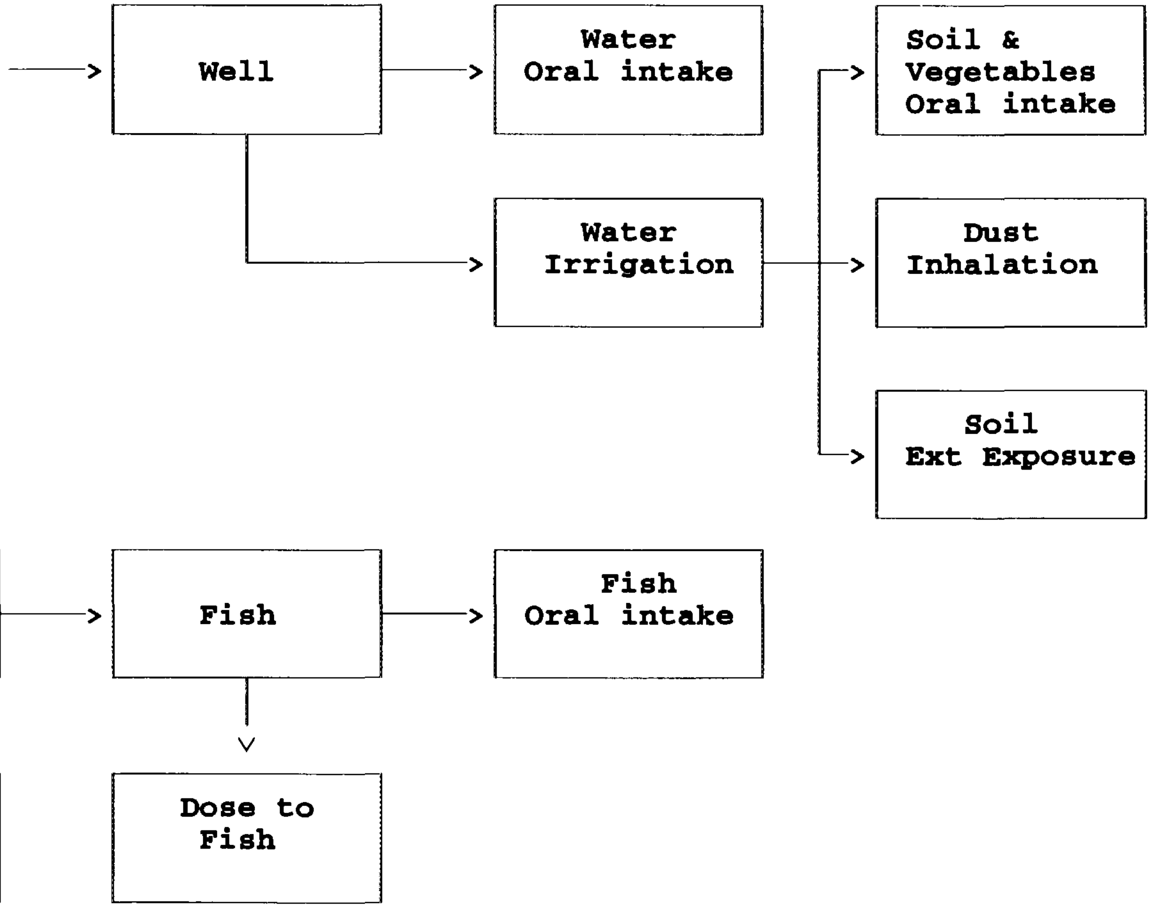


DIAGRAM 2 - CENTRAL SCENARIO

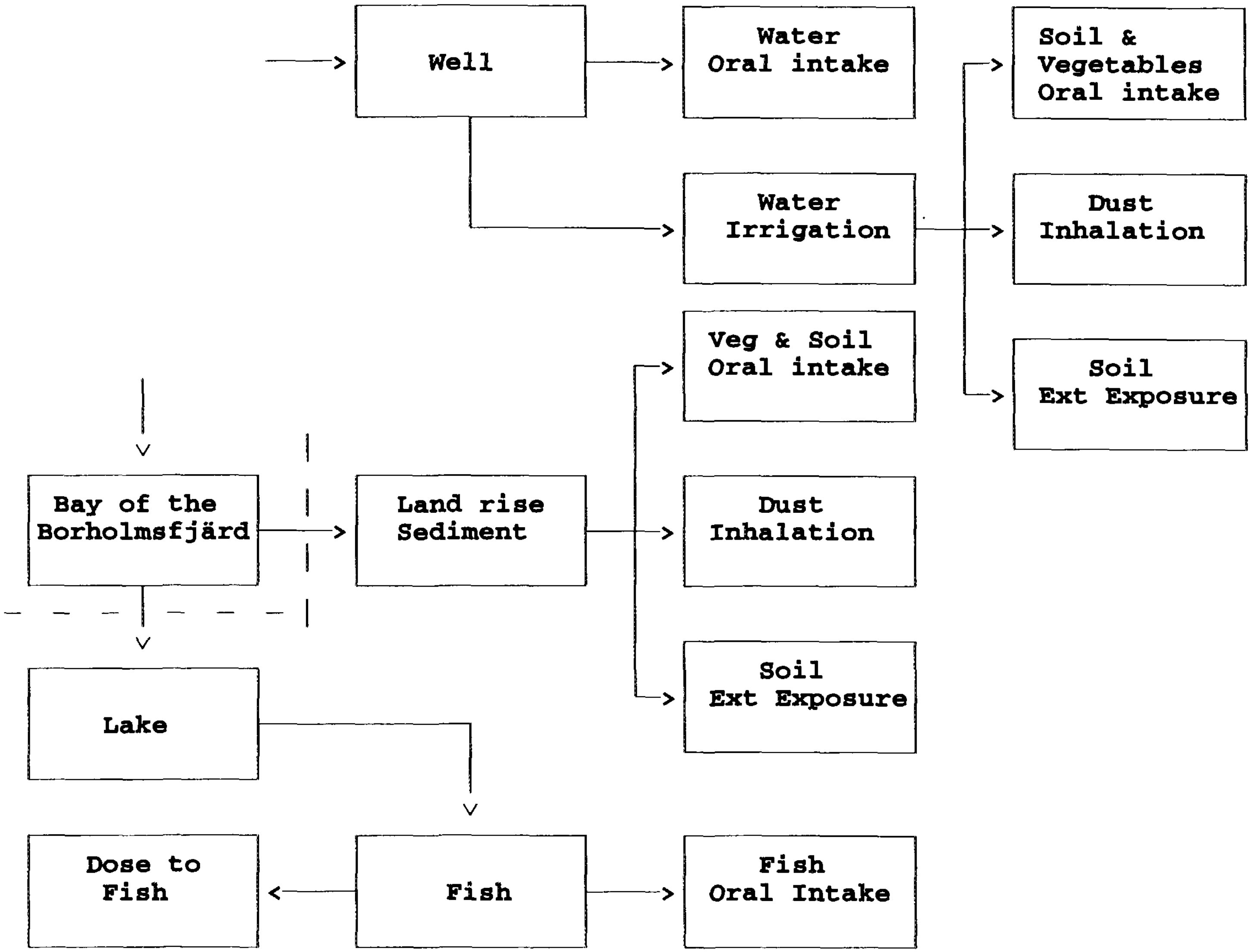
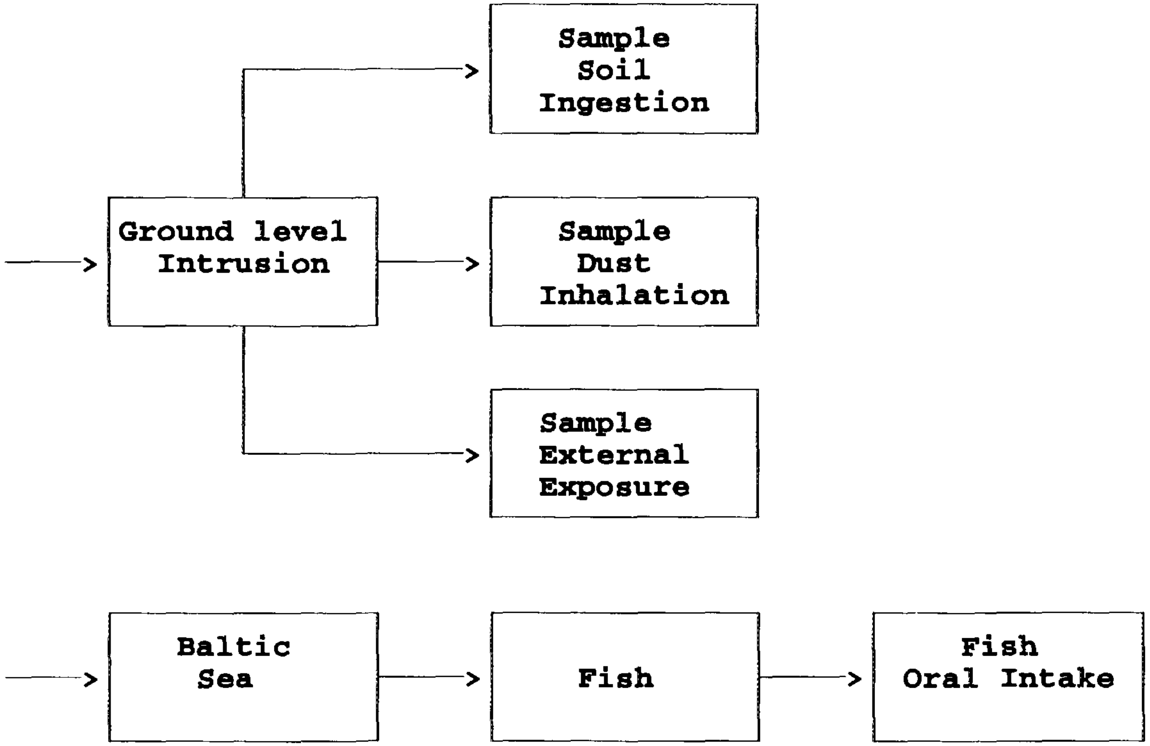


DIAGRAM 2 - CENTRAL SCENARIO (CONTINUED)



10 Table 1 - Resulting Dose Impact for Reference Scenario

	A	B	C	D	E	F	G	H	I	J	K	L
201	Nuclide	Drinking water		Irrigation - Individual			Irrigation - Population			[redacted]	Fish	
202		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral		Individual	Population
203		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[mSv/Bq h]	[Sv/Bq y]	[manSv/Bq y]
204	C-14	2.8E-14	3.3E-12		1.1E-17	4.1E-15		1.3E-15	4.9E-13	3.8E-18	5.1E-19	5.1E-16
205	Cl-36	4.2E-14	5.0E-12	7.9E-15	1.1E-16	6.2E-15	9.5E-13	1.3E-14	7.4E-13	2.3E-19	1.4E-17	1.4E-14
206	Ni-59	2.8E-15	3.3E-13	4.5E-16	1.4E-17	4.1E-16	5.4E-14	1.7E-15	4.9E-14	2.7E-19	5.6E-21	5.6E-18
207	Se-79	1.3E-13	1.5E-11		4.9E-17	1.9E-14		5.9E-15	2.2E-12	2.6E-17	4.0E-17	4.0E-14
208	Sr-90	2.5E-12	3.0E-10	1.1E-15	7.1E-15	3.1E-13	1.3E-13	8.5E-13	3.7E-11	1.7E-19	4.0E-18	4.0E-15
209	Zr-93	5.0E-14	6.0E-12		4.9E-15	7.4E-15		5.9E-13	8.9E-13	1.5E-20	1.2E-19	1.2E-16
210	Nb-94	6.3E-14	7.5E-12	1.5E-12	1.6E-15	9.3E-15	1.9E-10	2.0E-13	1.1E-12	6.5E-15	5.0E-19	5.0E-16
211	Tc-99	2.5E-14	3.0E-12	6.1E-19	4.9E-17	3.7E-15	7.3E-17	5.9E-15	4.4E-13	2.3E-19	3.0E-20	3.0E-17
212	Pd-107	2.5E-15	3.0E-13		9.8E-17	3.7E-16		1.2E-14	4.4E-14	1.1E-19	1.0E-20	1.0E-17
213	Sn-126	2.5E-13	3.0E-11	6.0E-14	4.9E-16	3.7E-14	7.2E-12	5.9E-14	4.4E-12		3.0E-17	3.0E-14
214	I-129	1.3E-11	1.5E-09	2.2E-14	3.3E-15	1.9E-12	2.6E-12	3.9E-13	2.2E-10	4.4E-19	9.8E-17	9.8E-14
215	Cs-135	8.3E-14	1.0E-11		2.5E-17	1.2E-14		2.9E-15	1.5E-12	1.7E-20	4.5E-20	4.5E-17
216	Cs-137	6.3E-13	7.5E-11	4.4E-13	1.2E-16	7.8E-14	5.3E-11	1.4E-14	9.3E-12	7.2E-19	3.3E-19	3.3E-16
217	Sm-151	5.0E-15	6.0E-13	4.7E-18	2.2E-16	6.9E-16	5.7E-16	2.6E-14	8.3E-14	8.2E-23	1.0E-24	1.0E-21
218	Ra-226	3.6E-11	4.3E-09	7.3E-15	4.9E-14	5.3E-12	8.8E-13	5.8E-12	6.3E-10	1.9E-14	2.9E-17	2.9E-14
219	Th-229	1.3E-10	1.5E-08	1.0E-13	1.1E-11	1.8E-11	1.2E-11	1.3E-09	2.2E-09	5.8E-16	3.0E-18	3.0E-15
220	Th-230	2.5E-11	3.0E-09	9.2E-16	4.9E-12	3.7E-12	1.1E-13	5.9E-10	4.4E-10	4.4E-17	6.0E-19	6.0E-16
221	Th-232	8.3E-11	1.0E-08	6.9E-16	2.5E-11	1.2E-11	8.2E-14	2.9E-09	1.5E-09	3.7E-17	2.0E-18	2.0E-15
222	Pa-231	3.6E-10	4.3E-08	3.5E-14	1.6E-11	5.3E-11	4.2E-12	2.0E-09	6.3E-09	4.5E-16	2.9E-17	2.9E-14
223	U-233	6.3E-12	7.5E-10	5.0E-16	9.8E-13	9.3E-13	6.1E-14	1.2E-10	1.1E-10	7.4E-18	2.5E-19	2.5E-16
224	U-234	6.3E-12	7.5E-10	8.4E-16	9.8E-13	9.3E-13	1.0E-13	1.2E-10	1.1E-10	7.3E-18	2.5E-19	2.5E-16
225	U-235	5.0E-12	6.0E-10	1.7E-13	4.9E-13	7.4E-13	2.0E-11	5.9E-11	8.9E-11	6.8E-18	2.0E-19	2.0E-16
226	U-236	5.0E-12	6.0E-10	7.6E-16	9.8E-13	7.4E-13	9.1E-14	1.2E-10	8.9E-11	7.0E-18	2.0E-19	2.0E-16
227	U-238	5.0E-12	6.0E-10	6.7E-16	4.9E-13	7.4E-13	8.1E-14	5.9E-11	8.9E-11	6.5E-18	2.0E-19	2.0E-16
228	Np-237	1.3E-10	1.5E-08	3.2E-14	4.9E-12	1.9E-11	3.8E-12	5.9E-10	2.2E-09	1.6E-18	2.0E-18	2.0E-15
229	Pu-238	8.3E-11	1.0E-08	8.0E-16	2.9E-12	1.2E-11	9.6E-14	3.5E-10	1.4E-09	3.4E-20	5.4E-21	5.4E-18
230	Pu-239	8.3E-11	1.0E-08	3.9E-16	4.9E-12	1.2E-11	4.7E-14	5.9E-10	1.5E-09	3.2E-20	5.4E-21	5.4E-18
231	Pu-240	8.3E-11	1.0E-08	8.6E-16	4.9E-12	1.2E-11	1.0E-13	5.9E-10	1.5E-09	3.2E-20	5.4E-21	5.4E-18
232	Pu-242	8.3E-11	1.0E-08	7.1E-16	4.9E-12	1.2E-11	8.5E-14	5.9E-10	1.5E-09	3.0E-20	5.4E-21	5.4E-18
233	Am-241	8.3E-11	1.0E-08	2.9E-14	4.8E-12	1.2E-11	3.4E-12	5.8E-10	1.5E-09	1.3E-19	1.7E-20	1.7E-17
234	Am-243	8.3E-11	1.0E-08	6.4E-14	4.9E-12	1.2E-11	7.7E-12	5.9E-10	1.5E-09	8.2E-19	1.7E-20	1.7E-17
235	Cm-245	8.3E-11	1.0E-08	3.2E-14	4.9E-12	1.2E-11	3.8E-12	5.9E-10	1.5E-09	3.5E-19	5.4E-21	5.4E-18
236	Cm-246	8.3E-11	1.0E-08		4.9E-12	1.2E-11		5.9E-10	1.5E-09	4.3E-20	5.4E-21	5.4E-18
237	Cm-248	3.6E-10	4.3E-08		1.6E-11	5.3E-11		2.0E-09	6.3E-09		2.3E-20	2.3E-17

	A	B	C	D	E	F	G	H	I	J	K	L
240	**Table 2 - Resulting Dose Impact for Central Scenario**											
241		**Section 4, time in future =**			0	[y]						
242	**Nuclide**	**Drinking water**		**Irrigation - Individual**			**Irrigation - Population**			[redacted]	**Fish**	
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral		Individual	Population
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[mSv/Bq h]	[Sv/Bq y]	[manSv/Bq y]
245	C-14	2.8E-14	3.3E-12							3.8E-18	5.1E-19	5.1E-16
246	Cl-36	4.2E-14	5.0E-12							2.3E-19	1.4E-17	1.4E-14
247	Ni-59	2.8E-15	3.3E-13							2.7E-19	5.6E-21	5.6E-18
248	Se-79	1.3E-13	1.5E-11							2.6E-17	4.0E-17	4.0E-14
249	Sr-90	2.5E-12	3.0E-10							1.7E-19	4.0E-18	4.0E-15
250	Zr-93	5.0E-14	6.0E-12							1.5E-20	1.2E-19	1.2E-16
251	Nb-94	6.3E-14	7.5E-12							6.5E-15	5.0E-19	5.0E-16
252	Tc-99	2.5E-14	3.0E-12							2.3E-19	3.0E-20	3.0E-17
253	Pd-107	2.5E-15	3.0E-13							1.1E-19	1.0E-20	1.0E-17
254	Sn-126	2.5E-13	3.0E-11								3.0E-17	3.0E-14
255	I-129	1.3E-11	1.5E-09							4.4E-19	9.8E-17	9.8E-14
256	Cs-135	8.3E-14	1.0E-11							1.7E-20	4.5E-20	4.5E-17
257	Cs-137	6.3E-13	7.5E-11							7.2E-19	3.3E-19	3.3E-16
258	Sm-151	5.0E-15	6.0E-13							8.2E-23	1.0E-24	1.0E-21
259	Ra-226	3.6E-11	4.3E-09							1.9E-14	2.9E-17	2.9E-14
260	Th-229	1.3E-10	1.5E-08							5.8E-16	3.0E-18	3.0E-15
261	Th-230	2.5E-11	3.0E-09							4.4E-17	6.0E-19	6.0E-16
262	Th-232	8.3E-11	1.0E-08							3.7E-17	2.0E-18	2.0E-15
263	Pa-231	3.6E-10	4.3E-08							4.5E-16	2.9E-17	2.9E-14
264	U-233	6.3E-12	7.5E-10							7.4E-18	2.5E-19	2.5E-16
265	U-234	6.3E-12	7.5E-10							7.3E-18	2.5E-19	2.5E-16
266	U-235	5.0E-12	6.0E-10							6.8E-18	2.0E-19	2.0E-16
267	U-236	5.0E-12	6.0E-10							7.0E-18	2.0E-19	2.0E-16
268	U-238	5.0E-12	6.0E-10							6.5E-18	2.0E-19	2.0E-16
269	Np-237	1.3E-10	1.5E-08							1.6E-18	2.0E-18	2.0E-15
270	Pu-238	8.3E-11	1.0E-08							3.4E-20	5.4E-21	5.4E-18
271	Pu-239	8.3E-11	1.0E-08							3.2E-20	5.4E-21	5.4E-18
272	Pu-240	8.3E-11	1.0E-08							3.2E-20	5.4E-21	5.4E-18
273	Pu-242	8.3E-11	1.0E-08							3.0E-20	5.4E-21	5.4E-18
274	Am-241	8.3E-11	1.0E-08							1.3E-19	1.7E-20	1.7E-17
275	Am-243	8.3E-11	1.0E-08							8.2E-19	1.7E-20	1.7E-17
276	Cm-245	8.3E-11	1.0E-08							3.5E-19	5.4E-21	5.4E-18
277	Cm-246	8.3E-11	1.0E-08							4.3E-20	5.4E-21	5.4E-18
278	Cm-248	3.6E-10	4.3E-08								2.3E-20	2.3E-17

	M	N	O	P	Q	R	S	T	U	V	W	X
240		**Table 2 (continued)**										
241		**Section 4, time in future =**			0	[y]						
242	**Nuclide**	**Fish - after Glaciation**		**Landrise sediment - Individual**			**Landrise sediment - Population**			**Intrusion - Individual**		
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral	External	Inhalation	Oral
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[Sv/Bq]	[Sv/Bq]	[Sv/Bq]
245	C-14										3.9E-17	2.0E-15
246	Cl-36										3.9E-16	2.9E-15
247	Ni-59										5.1E-17	2.0E-16
248	Se-79										1.8E-16	8.8E-15
249	Sr-90										3.5E-14	1.8E-13
250	Zr-93										1.8E-14	3.5E-15
251	Nb-94									2.7E-12	5.9E-15	4.4E-15
252	Tc-99										1.8E-16	1.8E-15
253	Pd-107										3.5E-16	1.8E-16
254	Sn-126									2.0E-13	1.8E-15	1.8E-14
255	I-129									8.6E-14	1.2E-14	8.8E-13
256	Cs-135										8.8E-17	5.9E-15
257	Cs-137									2.1E-12	5.9E-16	4.4E-14
258	Sm-151										8.8E-16	3.5E-16
259	Ra-226										1.8E-13	2.5E-12
260	Th-229									3.3E-13	3.9E-11	8.8E-12
261	Th-230										1.8E-11	1.8E-12
262	Th-232										8.8E-11	5.9E-12
263	Pa-231									1.7E-13	5.9E-11	2.5E-11
264	U-233										3.5E-12	4.4E-13
265	U-234										3.5E-12	4.4E-13
266	U-235									5.4E-13	1.8E-12	3.5E-13
267	U-236										3.5E-12	3.5E-13
268	U-238										1.8E-12	3.5E-13
269	Np-237									1.2E-13	1.8E-11	8.8E-12
270	Pu-238										1.2E-11	5.9E-12
271	Pu-239										1.8E-11	5.9E-12
272	Pu-240										1.8E-11	5.9E-12
273	Pu-242										1.8E-11	5.9E-12
274	Am-241									1.1E-13	1.8E-11	5.9E-12
275	Am-243									2.0E-13	1.8E-11	5.9E-12
276	Cm-245									2.0E-13	1.8E-11	5.9E-12
277	Cm-246									2.0E-13	1.8E-11	5.9E-12
278	Cm-248									2.0E-13	5.9E-11	2.5E-11

	A	B	C	D	E	F	G	H	I	J	K	L
240		**Table 2 - Resulting Dose Impact for Central Scenario**										
241		**Section 4, time in future =**			5000	[y]						
242	**Nuclide**	**Drinking water**		**Irrigation - Individual**			**Irrigation - Population**			[redacted]	**Fish**	
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral		Individual	Population
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[mSv/Bq h]	[Sv/Bq y]	[manSv/Bq y]
245	C-14	2.8E-14	3.3E-12		2.7E-17	7.7E-15		3.2E-15	9.2E-13	3.8E-15	5.1E-16	5.1E-13
246	Cl-36	4.2E-14	5.0E-12	1.9E-14	2.7E-16	1.2E-14	2.3E-12	3.2E-14	1.4E-12	2.3E-16	1.4E-14	1.4E-11
247	Ni-59	2.8E-15	3.3E-13	1.1E-15	3.4E-17	7.7E-16	1.3E-13	4.1E-15	9.2E-14	2.7E-16	5.6E-18	5.6E-15
248	Se-79	1.3E-13	1.5E-11		1.2E-16	3.5E-14		1.4E-14	4.1E-12	2.6E-14	4.0E-14	4.0E-11
249	Sr-90	2.5E-12	3.0E-10	1.7E-15	1.1E-14	3.9E-13	2.0E-13	1.3E-12	4.7E-11	1.7E-16	4.0E-15	4.0E-12
250	Zr-93	5.0E-14	6.0E-12		1.2E-14	1.4E-14		1.4E-12	1.7E-12	1.5E-17	1.2E-16	1.2E-13
251	Nb-94	6.3E-14	7.5E-12	3.8E-12	4.0E-15	1.7E-14	4.5E-10	4.8E-13	2.1E-12	6.5E-12	5.0E-16	5.0E-13
252	Tc-99	2.5E-14	3.0E-12	1.5E-18	1.2E-16	6.9E-15	1.8E-16	1.4E-14	8.3E-13	2.3E-16	3.0E-17	3.0E-14
253	Pd-107	2.5E-15	3.0E-13		2.4E-16	6.9E-16		2.9E-14	8.3E-14	1.1E-16	1.0E-17	1.0E-14
254	Sn-126	2.5E-13	3.0E-11	1.5E-13	1.2E-15	6.9E-14	1.8E-11	1.4E-13	8.3E-12		3.0E-14	3.0E-11
255	I-129	1.3E-11	1.5E-09	5.3E-14	8.0E-15	3.5E-12	6.3E-12	9.6E-13	4.2E-10	4.4E-16	9.8E-14	9.8E-11
256	Cs-135	8.3E-14	1.0E-11		6.0E-17	2.3E-14		7.2E-15	2.8E-12	1.7E-17	4.5E-17	4.5E-14
257	Cs-137	6.3E-13	7.5E-11	6.8E-13	1.8E-16	1.0E-13	8.2E-11	2.2E-14	1.2E-11	7.2E-16	3.3E-16	3.3E-13
258	Sm-151	5.0E-15	6.0E-13	9.5E-18	4.4E-16	1.1E-15	1.1E-15	5.3E-14	1.3E-13	8.2E-20	1.0E-21	1.0E-18
259	Ra-226	3.6E-11	4.3E-09	1.8E-14	1.2E-13	9.7E-12	2.1E-12	1.4E-11	1.2E-09	1.9E-11	2.9E-14	2.9E-11
260	Th-229	1.3E-10	1.5E-08	2.5E-13	2.7E-11	3.4E-11	3.0E-11	3.2E-09	4.1E-09	5.8E-13	3.0E-15	3.0E-12
261	Th-230	2.5E-11	3.0E-09	2.3E-15	1.2E-11	6.9E-12	2.7E-13	1.4E-09	8.3E-10	4.4E-14	6.0E-16	6.0E-13
262	Th-232	8.3E-11	1.0E-08	1.7E-15	6.0E-11	2.3E-11	2.0E-13	7.2E-09	2.8E-09	3.7E-14	2.0E-15	2.0E-12
263	Pa-231	3.6E-10	4.3E-08	8.6E-14	4.0E-11	9.9E-11	1.0E-11	4.8E-09	1.2E-08	4.5E-13	2.9E-14	2.9E-11
264	U-233	6.3E-12	7.5E-10	1.2E-15	2.4E-12	1.7E-12	1.5E-13	2.9E-10	2.1E-10	7.4E-15	2.5E-16	2.5E-13
265	U-234	6.3E-12	7.5E-10	2.0E-15	2.4E-12	1.7E-12	2.5E-13	2.9E-10	2.1E-10	7.3E-15	2.5E-16	2.5E-13
266	U-235	5.0E-12	6.0E-10	4.1E-13	1.2E-12	1.4E-12	4.9E-11	1.4E-10	1.7E-10	6.8E-15	2.0E-16	2.0E-13
267	U-236	5.0E-12	6.0E-10	1.9E-15	2.4E-12	1.4E-12	2.2E-13	2.9E-10	1.7E-10	7.0E-15	2.0E-16	2.0E-13
268	U-238	5.0E-12	6.0E-10	1.6E-15	1.2E-12	1.4E-12	2.0E-13	1.4E-10	1.7E-10	6.5E-15	2.0E-16	2.0E-13
269	Np-237	1.3E-10	1.5E-08	7.8E-14	1.2E-11	3.5E-11	9.3E-12	1.4E-09	4.2E-09	1.6E-15	2.0E-15	2.0E-12
270	Pu-238	8.3E-11	1.0E-08	1.6E-15	5.9E-12	1.8E-11	1.9E-13	7.1E-10	2.2E-09	3.4E-17	5.4E-18	5.4E-15
271	Pu-239	8.3E-11	1.0E-08	9.6E-16	1.2E-11	2.3E-11	1.1E-13	1.4E-09	2.8E-09	3.2E-17	5.4E-18	5.4E-15
272	Pu-240	8.3E-11	1.0E-08	2.1E-15	1.2E-11	2.3E-11	2.5E-13	1.4E-09	2.8E-09	3.2E-17	5.4E-18	5.4E-15
273	Pu-242	8.3E-11	1.0E-08	1.7E-15	1.2E-11	2.3E-11	2.1E-13	1.4E-09	2.8E-09	3.0E-17	5.4E-18	5.4E-15
274	Am-241	8.3E-11	1.0E-08	6.7E-14	1.1E-11	2.2E-11	8.1E-12	1.3E-09	2.6E-09	1.3E-16	1.7E-17	1.7E-14
275	Am-243	8.3E-11	1.0E-08	1.6E-13	1.2E-11	2.3E-11	1.9E-11	1.4E-09	2.8E-09	8.2E-16	1.7E-17	1.7E-14
276	Cm-245	8.3E-11	1.0E-08	7.8E-14	1.2E-11	2.3E-11	9.4E-12	1.4E-09	2.8E-09	3.5E-16	5.4E-18	5.4E-15
277	Cm-246	8.3E-11	1.0E-08		1.2E-11	2.3E-11		1.4E-09	2.8E-09	4.3E-17	5.4E-18	5.4E-15
278	Cm-248	3.6E-10	4.3E-08		4.0E-11	9.9E-11		4.8E-09	1.2E-08		2.3E-17	2.3E-14

	M	N	O	P	Q	R	S	T	U	V	W	X
240		**Table 2 (continued)**										
241		**Section 4, time in future =**			5000	[y]						
242	**Nuclide**	**Fish - after Glaciation**		**Landrise sediment - Individual**			**Landrise sediment - Population**			**Intrusion - Individual**		
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral	External	Inhalation	Oral
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[Sv/Bq]	[Sv/Bq]	[Sv/Bq]
245	C-14				1.5E-16	8.7E-15		1.8E-14	1.0E-12		3.9E-17	2.0E-15
246	Cl-36										3.9E-16	2.9E-15
247	Ni-59			9.6E-15	3.0E-16	1.4E-15	1.2E-12	3.6E-14	1.6E-13		5.1E-17	2.0E-16
248	Se-79				1.0E-15	6.1E-14		1.3E-13	7.3E-12		1.8E-16	8.8E-15
249	Sr-90			1.0E-56	6.5E-56	3.8E-55	1.2E-54	7.8E-54	4.5E-53		3.5E-14	1.8E-13
250	Zr-93				1.1E-13	2.5E-14		1.3E-11	3.1E-12		1.8E-14	3.5E-15
251	Nb-94			3.0E-11	3.2E-14	2.8E-14	3.6E-09	3.8E-12	3.3E-12	2.7E-12	5.9E-15	4.4E-15
252	Tc-99			1.3E-17	1.1E-15	1.3E-14	1.6E-15	1.3E-13	1.5E-12		1.8E-16	1.8E-15
253	Pd-107				2.2E-15	1.3E-15		2.6E-13	1.5E-13		3.5E-16	1.8E-16
254	Sn-126			1.3E-12	1.1E-14	1.2E-13	1.6E-10	1.3E-12	1.5E-11	2.0E-13	1.8E-15	1.8E-14
255	I-129			4.7E-13	7.1E-14	6.1E-12	5.6E-11	8.5E-12	7.4E-10	8.6E-14	1.2E-14	8.8E-13
256	Cs-135				5.5E-16	4.3E-14		6.6E-14	5.1E-12		8.8E-17	5.9E-15
257	Cs-137			3.4E-52	9.3E-56	8.1E-54	4.1E-50	1.1E-53	9.7E-52	2.1E-12	5.9E-16	4.4E-14
258	Sm-151			2.9E-30	1.4E-28	6.3E-29	3.5E-28	1.6E-26	7.6E-27		8.8E-16	3.5E-16
259	Ra-226			2.8E-14	1.9E-13	3.1E-12	3.4E-12	2.2E-11	3.7E-10		1.8E-13	2.5E-12
260	Th-229			1.6E-12	1.7E-10	4.4E-11	1.9E-10	2.0E-08	5.2E-09	3.3E-13	3.9E-11	8.8E-12
261	Th-230			2.0E-14	1.1E-10	1.2E-11	2.4E-12	1.3E-08	1.5E-09		1.8E-11	1.8E-12
262	Th-232			1.5E-14	5.5E-10	4.3E-11	1.8E-12	6.6E-08	5.1E-09		8.8E-11	5.9E-12
263	Pa-231			7.2E-13	3.4E-10	1.7E-10	8.7E-11	4.0E-08	2.0E-08	1.7E-13	5.9E-11	2.5E-11
264	U-233			1.1E-14	2.2E-11	3.1E-12	1.3E-12	2.6E-09	3.8E-10		3.5E-12	4.4E-13
265	U-234			1.9E-14	2.2E-11	3.2E-12	2.2E-12	2.6E-09	3.8E-10		3.5E-12	4.4E-13
266	U-235			3.7E-12	1.1E-11	2.6E-12	4.5E-10	1.3E-09	3.1E-10	5.4E-13	1.8E-12	3.5E-13
267	U-236			1.7E-14	2.2E-11	2.6E-12	2.0E-12	2.6E-09	3.1E-10		3.5E-12	3.5E-13
268	U-238			1.5E-14	1.1E-11	2.6E-12	1.8E-12	1.3E-09	3.1E-10		1.8E-12	3.5E-13
269	Np-237			7.1E-13	1.1E-10	6.4E-11	8.6E-11	1.3E-08	7.7E-09	1.2E-13	1.8E-11	8.8E-12
270	Pu-238			2.2E-28	8.1E-25	4.7E-25	2.6E-26	9.7E-23	5.6E-23		1.2E-11	5.9E-12
271	Pu-239			7.8E-15	9.8E-11	3.8E-11	9.4E-13	1.2E-08	4.6E-09		1.8E-11	5.9E-12
272	Pu-240			1.3E-14	7.2E-11	2.8E-11	1.5E-12	8.6E-09	3.3E-09		1.8E-11	5.9E-12
273	Pu-242			1.6E-14	1.1E-10	4.2E-11	1.9E-12	1.3E-08	5.1E-09		1.8E-11	5.9E-12
274	Am-241			9.8E-16	1.6E-13	6.3E-14	1.2E-13	2.0E-11	7.6E-12	1.1E-13	1.8E-11	5.9E-12
275	Am-243			9.9E-13	7.5E-11	2.9E-11	1.2E-10	9.0E-09	3.5E-09	2.0E-13	1.8E-11	5.9E-12
276	Cm-245			5.2E-13	7.9E-11	3.1E-11	6.2E-11	9.5E-09	3.7E-09	2.0E-13	1.8E-11	5.9E-12
277	Cm-246				6.1E-11	2.4E-11		7.3E-09	2.8E-09	2.0E-13	1.8E-11	5.9E-12
278	Cm-248				3.6E-10	1.8E-10		4.4E-08	2.2E-08	2.0E-13	5.9E-11	2.5E-11

	A	B	C	D	E	F	G	H	I	J	K	L
240		**Table 2 - Resulting Dose Impact for Central Scenario**										
241		**Section 4, time in future =**			25000	[y]						
242	**Nuclide**	**Drinking water**		**Irrigation - Individual**			**Irrigation - Population**			[redacted]	**Fish**	
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral		Individual	Population
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[mSv/Bq h]	[Sv/Bq y]	[manSv/Bq y]
245	C-14	2.8E-14	3.3E-12		2.7E-17	7.7E-15		3.2E-15	9.2E-13	3.8E-15	5.1E-16	5.1E-13
246	Cl-36	4.2E-14	5.0E-12	1.9E-14	2.7E-16	1.2E-14	2.3E-12	3.2E-14	1.4E-12	2.3E-16	1.4E-14	1.4E-11
247	Ni-59	2.8E-15	3.3E-13	1.1E-15	3.4E-17	7.7E-16	1.3E-13	4.1E-15	9.2E-14	2.7E-16	5.6E-18	5.6E-15
248	Se-79	1.3E-13	1.5E-11		1.2E-16	3.5E-14		1.4E-14	4.1E-12	2.6E-14	4.0E-14	4.0E-11
249	Sr-90	2.5E-12	3.0E-10	1.7E-15	1.1E-14	3.9E-13	2.0E-13	1.3E-12	4.7E-11	1.7E-16	4.0E-15	4.0E-12
250	Zr-93	5.0E-14	6.0E-12		1.2E-14	1.4E-14		1.4E-12	1.7E-12	1.5E-17	1.2E-16	1.2E-13
251	Nb-94	6.3E-14	7.5E-12	3.8E-12	4.0E-15	1.7E-14	4.5E-10	4.8E-13	2.1E-12	6.5E-12	5.0E-16	5.0E-13
252	Tc-99	2.5E-14	3.0E-12	1.5E-18	1.2E-16	6.9E-15	1.8E-16	1.4E-14	8.3E-13	2.3E-16	3.0E-17	3.0E-14
253	Pd-107	2.5E-15	3.0E-13		2.4E-16	6.9E-16		2.9E-14	8.3E-14	1.1E-16	1.0E-17	1.0E-14
254	Sn-126	2.5E-13	3.0E-11	1.5E-13	1.2E-15	6.9E-14	1.8E-11	1.4E-13	8.3E-12		3.0E-14	3.0E-11
255	I-129	1.3E-11	1.5E-09	5.3E-14	8.0E-15	3.5E-12	6.3E-12	9.6E-13	4.2E-10	4.4E-16	9.8E-14	9.8E-11
256	Cs-135	8.3E-14	1.0E-11		6.0E-17	2.3E-14		7.2E-15	2.8E-12	1.7E-17	4.5E-17	4.5E-14
257	Cs-137	6.3E-13	7.5E-11	6.8E-13	1.8E-16	1.0E-13	8.2E-11	2.2E-14	1.2E-11	7.2E-16	3.3E-16	3.3E-13
258	Sm-151	5.0E-15	6.0E-13	9.5E-18	4.4E-16	1.1E-15	1.1E-15	5.3E-14	1.3E-13	8.2E-20	1.0E-21	1.0E-18
259	Ra-226	3.6E-11	4.3E-09	1.8E-14	1.2E-13	9.7E-12	2.1E-12	1.4E-11	1.2E-09	1.9E-11	2.9E-14	2.9E-11
260	Th-229	1.3E-10	1.5E-08	2.5E-13	2.7E-11	3.4E-11	3.0E-11	3.2E-09	4.1E-09	5.8E-13	3.0E-15	3.0E-12
261	Th-230	2.5E-11	3.0E-09	2.3E-15	1.2E-11	6.9E-12	2.7E-13	1.4E-09	8.3E-10	4.4E-14	6.0E-16	6.0E-13
262	Th-232	8.3E-11	1.0E-08	1.7E-15	6.0E-11	2.3E-11	2.0E-13	7.2E-09	2.8E-09	3.7E-14	2.0E-15	2.0E-12
263	Pa-231	3.6E-10	4.3E-08	8.6E-14	4.0E-11	9.9E-11	1.0E-11	4.8E-09	1.2E-08	4.5E-13	2.9E-14	2.9E-11
264	U-233	6.3E-12	7.5E-10	1.2E-15	2.4E-12	1.7E-12	1.5E-13	2.9E-10	2.1E-10	7.4E-15	2.5E-16	2.5E-13
265	U-234	6.3E-12	7.5E-10	2.0E-15	2.4E-12	1.7E-12	2.5E-13	2.9E-10	2.1E-10	7.3E-15	2.5E-16	2.5E-13
266	U-235	5.0E-12	6.0E-10	4.1E-13	1.2E-12	1.4E-12	4.9E-11	1.4E-10	1.7E-10	6.8E-15	2.0E-16	2.0E-13
267	U-236	5.0E-12	6.0E-10	1.9E-15	2.4E-12	1.4E-12	2.2E-13	2.9E-10	1.7E-10	7.0E-15	2.0E-16	2.0E-13
268	U-238	5.0E-12	6.0E-10	1.6E-15	1.2E-12	1.4E-12	2.0E-13	1.4E-10	1.7E-10	6.5E-15	2.0E-16	2.0E-13
269	Np-237	1.3E-10	1.5E-08	7.8E-14	1.2E-11	3.5E-11	9.3E-12	1.4E-09	4.2E-09	1.6E-15	2.0E-15	2.0E-12
270	Pu-238	8.3E-11	1.0E-08	1.6E-15	5.9E-12	1.8E-11	1.9E-13	7.1E-10	2.2E-09	3.4E-17	5.4E-18	5.4E-15
271	Pu-239	8.3E-11	1.0E-08	9.6E-16	1.2E-11	2.3E-11	1.1E-13	1.4E-09	2.8E-09	3.2E-17	5.4E-18	5.4E-15
272	Pu-240	8.3E-11	1.0E-08	2.1E-15	1.2E-11	2.3E-11	2.5E-13	1.4E-09	2.8E-09	3.2E-17	5.4E-18	5.4E-15
273	Pu-242	8.3E-11	1.0E-08	1.7E-15	1.2E-11	2.3E-11	2.1E-13	1.4E-09	2.8E-09	3.0E-17	5.4E-18	5.4E-15
274	Am-241	8.3E-11	1.0E-08	6.7E-14	1.1E-11	2.2E-11	8.1E-12	1.3E-09	2.6E-09	1.3E-16	1.7E-17	1.7E-14
275	Am-243	8.3E-11	1.0E-08	1.6E-13	1.2E-11	2.3E-11	1.9E-11	1.4E-09	2.8E-09	8.2E-16	1.7E-17	1.7E-14
276	Cm-245	8.3E-11	1.0E-08	7.8E-14	1.2E-11	2.3E-11	9.4E-12	1.4E-09	2.8E-09	3.5E-16	5.4E-18	5.4E-15
277	Cm-246	8.3E-11	1.0E-08		1.2E-11	2.3E-11		1.4E-09	2.8E-09	4.3E-17	5.4E-18	5.4E-15
278	Cm-248	3.6E-10	4.3E-08		4.0E-11	9.9E-11		4.8E-09	1.2E-08		2.3E-17	2.3E-14

	M	N	O	P	Q	R	S	T	U	V	W	X
240		**Table 2 (continued)**										
241		**Section 4, time in future =**			25000	[y]						
242	**Nuclide**	**Fish - after Glaciation**		**Landrise sediment - Individual**			**Landrise sediment - Population**			**Intrusion - Individual**		
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral	External	Inhalation	Oral
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[Sv/Bq]	[Sv/Bq]	[Sv/Bq]
245	C-14				1.3E-17	7.7E-16		1.6E-15	9.3E-14		3.9E-17	2.0E-15
246	Cl-36										3.9E-16	2.9E-15
247	Ni-59			8.0E-15	2.5E-16	1.1E-15	9.6E-13	3.0E-14	1.4E-13		5.1E-17	2.0E-16
248	Se-79				8.4E-16	4.9E-14		1.0E-13	5.9E-12		1.8E-16	8.8E-15
249	Sr-90			9.2E-266	5.8E-265	3.4E-264	1.1E-263	7.0E-263	4.1E-262		3.5E-14	1.8E-13
250	Zr-93				1.1E-13	2.5E-14		1.3E-11	3.0E-12		1.8E-14	3.5E-15
251	Nb-94			1.5E-11	1.6E-14	1.4E-14	1.8E-09	1.9E-12	1.7E-12	2.7E-12	5.9E-15	4.4E-15
252	Tc-99			1.3E-17	1.0E-15	1.2E-14	1.5E-15	1.2E-13	1.4E-12		1.8E-16	1.8E-15
253	Pd-107				2.2E-15	1.3E-15		2.6E-13	1.5E-13		3.5E-16	1.8E-16
254	Sn-126			1.1E-12	9.3E-15	1.1E-13	1.4E-10	1.1E-12	1.3E-11	2.0E-13	1.8E-15	1.8E-14
255	I-129			4.7E-13	7.0E-14	6.1E-12	5.6E-11	8.5E-12	7.4E-10	8.6E-14	1.2E-14	8.8E-13
256	Cs-135				5.5E-16	4.2E-14		6.6E-14	5.1E-12		8.8E-17	5.9E-15
257	Cs-137			9.6E-252	2.6E-255	2.3E-253	1.2E-249	3.1E-253	2.7E-251	2.1E-12	5.9E-16	4.4E-14
258	Sm-151			3.7E-97	1.7E-95	8.0E-96	4.4E-95	2.1E-93	9.6E-94		8.8E-16	3.5E-16
259	Ra-226			4.9E-18	3.2E-17	5.4E-16	5.9E-16	3.9E-15	6.4E-14		1.8E-13	2.5E-12
260	Th-229			2.4E-13	2.5E-11	6.6E-12	2.8E-11	3.0E-09	7.9E-10	3.3E-13	3.9E-11	8.8E-12
261	Th-230			1.7E-14	8.9E-11	1.0E-11	2.0E-12	1.1E-08	1.2E-09		1.8E-11	1.8E-12
262	Th-232			1.5E-14	5.5E-10	4.3E-11	1.8E-12	6.6E-08	5.1E-09		8.8E-11	5.9E-12
263	Pa-231			4.7E-13	2.2E-10	1.1E-10	5.7E-11	2.6E-08	1.3E-08	1.7E-13	5.9E-11	2.5E-11
264	U-233			1.0E-14	2.0E-11	2.9E-12	1.2E-12	2.4E-09	3.5E-10		3.5E-12	4.4E-13
265	U-234			1.8E-14	2.1E-11	3.0E-12	2.1E-12	2.5E-09	3.6E-10		3.5E-12	4.4E-13
266	U-235			3.7E-12	1.1E-11	2.6E-12	4.5E-10	1.3E-09	3.1E-10	5.4E-13	1.8E-12	3.5E-13
267	U-236			1.7E-14	2.2E-11	2.6E-12	2.0E-12	2.6E-09	3.1E-10		3.5E-12	3.5E-13
268	U-238			1.5E-14	1.1E-11	2.6E-12	1.8E-12	1.3E-09	3.1E-10		1.8E-12	3.5E-13
269	Np-237			7.1E-13	1.1E-10	6.3E-11	8.5E-11	1.3E-08	7.6E-09	1.2E-13	1.8E-11	8.8E-12
270	Pu-238			5.3E-97	1.9E-93	1.1E-93	6.4E-95	2.3E-91	1.4E-91		1.2E-11	5.9E-12
271	Pu-239			4.4E-15	5.5E-11	2.1E-11	5.3E-13	6.6E-09	2.6E-09		1.8E-11	5.9E-12
272	Pu-240			1.5E-15	8.7E-12	3.4E-12	1.8E-13	1.0E-09	4.0E-10		1.8E-11	5.9E-12
273	Pu-242			1.5E-14	1.1E-10	4.1E-11	1.8E-12	1.3E-08	4.9E-09		1.8E-11	5.9E-12
274	Am-241			1.2E-29	2.0E-27	7.9E-28	1.5E-27	2.4E-25	9.5E-26	1.1E-13	1.8E-11	5.9E-12
275	Am-243			1.5E-13	1.1E-11	4.4E-12	1.8E-11	1.4E-09	5.3E-10	2.0E-13	1.8E-11	5.9E-12
276	Cm-245			1.0E-13	1.5E-11	6.0E-12	1.2E-11	1.9E-09	7.2E-10	2.0E-13	1.8E-11	5.9E-12
277	Cm-246				3.3E-12	1.3E-12		3.9E-10	1.5E-10	2.0E-13	1.8E-11	5.9E-12
278	Cm-248				3.5E-10	1.7E-10		4.2E-08	2.1E-08	2.0E-13	5.9E-11	2.5E-11

	A	B	C	D	E	F	G	H	I	J	K	L
240	**Table 2 - Resulting Dose Impact for Central Scenario**											
241	**Section 4, time in future =**				125000	[y]						
242	**Nuclide**	**Drinking water**		**Irrigation - Individual**			**Irrigation - Population**			[redacted]	**Fish**	
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral		Individual	Population
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[mSv/Bq h]	[Sv/Bq y]	[manSv/Bq y]
245	C-14											
246	Cl-36											
247	Ni-59											
248	Se-79											
249	Sr-90											
250	Zr-93											
251	Nb-94											
252	Tc-99											
253	Pd-107											
254	Sn-126											
255	I-129											
256	Cs-135											
257	Cs-137											
258	Sm-151											
259	Ra-226											
260	Th-229											
261	Th-230											
262	Th-232											
263	Pa-231											
264	U-233											
265	U-234											
266	U-235											
267	U-236											
268	U-238											
269	Np-237											
270	Pu-238											
271	Pu-239											
272	Pu-240											
273	Pu-242											
274	Am-241											
275	Am-243											
276	Cm-245											
277	Cm-246											
278	Cm-248											

	M	N	O	P	Q	R	S	T	U	V	W	X
240		**Table 2 (continued)**										
241		**Section 4, time in future =**			125000	[y]						
242	**Nuclide**	**Fish - after Glaciation**		**Landrise sediment - Individual**			**Landrise sediment - Population**			**Intrusion - Individual**		
243		Individual	Population	External	Inhalation	Oral	External	Inhalation	Oral	External	Inhalation	Oral
244		[Sv/Bq y]	[manSv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[Sv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[manSv/Bq y]	[Sv/Bq]	[Sv/Bq]	[Sv/Bq]
245	C-14	8.3E-23	8.3E-20									
246	Cl-36	2.3E-23	2.3E-20									
247	Ni-59	7.5E-25	7.5E-22									
248	Se-79	4.5E-21	4.5E-18									
249	Sr-90	4.5E-22	4.5E-19									
250	Zr-93	1.6E-23	1.6E-20									
251	Nb-94	5.6E-23	5.6E-20									
252	Tc-99	3.4E-24	3.4E-21									
253	Pd-107	1.3E-24	1.3E-21									
254	Sn-126	4.0E-21	4.0E-18									
255	I-129	4.9E-21	4.9E-18									
256	Cs-135	7.3E-24	7.3E-21									
257	Cs-137	5.5E-23	5.5E-20									
258	Sm-151	1.7E-28	1.7E-25									
259	Ra-226	3.2E-21	3.2E-18									
260	Th-229	5.0E-22	5.0E-19									
261	Th-230	1.0E-22	1.0E-19									
262	Th-232	3.3E-22	3.3E-19									
263	Pa-231	4.5E-21	4.5E-18									
264	U-233	4.0E-23	4.0E-20									
265	U-234	4.0E-23	4.0E-20									
266	U-235	3.2E-23	3.2E-20									
267	U-236	3.2E-23	3.2E-20									
268	U-238	3.2E-23	3.2E-20									
269	Np-237	3.3E-22	3.3E-19									
270	Pu-238	8.9E-25	8.9E-22									
271	Pu-239	8.9E-25	8.9E-22									
272	Pu-240	8.9E-25	8.9E-22									
273	Pu-242	8.9E-25	8.9E-22									
274	Am-241	2.8E-24	2.8E-21									
275	Am-243	2.8E-24	2.8E-21									
276	Cm-245	8.9E-25	8.9E-22									
277	Cm-246	8.9E-25	8.9E-22									
278	Cm-248	3.8E-24	3.8E-21									

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